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Traditional and precision methods for studying porous space of oil-bearing formation

Sungatullin R., Islamova R., Kadyrov R., Sungatullina G.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

At present, the coefficient of porosity is traditionally determined by the method of Preobrazhensky and by the results of a petrophysical interpretation of well log data. However, there are many examples of the significant error in its determination, which ultimately affects the determination of their filter-capacitance properties, the recovery rate of oil and extracted reserves. In this paper, the porosity coefficients are compared by traditional and precision methods for oil-containing terrigenous reservoirs of the Paschian (Upper Devonian), and Tula and Bobrikovskian (Lower Carboniferous) horizons, as well as carbonate reservoirs of the Tournaisian stage, using the example of one of the deposits in the central part of the Volga-Ural oil and gas province. It is shown that precision methods make it possible to study in more detail the internal pore space of oil-containing reservoirs. X-ray computer microtomography showed the uneven and multidimensional porosity of Devonian sandstones, due to their micro-lamination. The most accurate values of the porosity coefficient from the results of microtomography were obtained for cubes of the smallest size (with linear dimensions of the sample less than 5 mm), so they correspond to a higher resolution of the survey, which allows detecting smaller pores. In this connection, the inverse dependence of the porosity coefficient on the size of the samples was established. Variability of porosity along the layers in the lateral direction is revealed (the property of 'microfaciality'). The combination of traditional and precision methods for determining porosity coefficients will allow us to calculate the oil recovery factor on explored and developed oil deposits more correctly, because additional information on pore size and cavity, connectivity and type of channels, as well as microfacies are taken into account.

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Keywords

ArcGIS, Devonian period, Lower Carboniferous period, Porosity, Reservoir, Volga-Ural oil and gas bearing province, X-ray CT

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